VERIFICATION OF TRANSLATION

The undersigned, Teruhisa Tsunoda, Director, HonyakuCenter Inc. Hirano-machi Century building 9F, 2-5-8 Hiranomachi, Osaka declares that:

Teruhisa Tsunoda is knowledgeable in the English and Japanese languages and that he believes the attached English translation is to his knowledge and belief, a complete and true translation of Japanese utility model application 62-106405 filed July 13,1987.

All statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or mprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

Honyaku Center Inc.
Hirano-machi Century building 9F
2-5-8 Hirano-machi, Chuo-ku,Osaka
541-0046 Japan
Telephone: (06) 6231-0966
Facsimile: (06) 6966-3633

July 15, 2004
Date

T. Tsunoda
Teruhisa Tsunoda

JAPANESE UNEXAMINED UTILITY MODEL APPLICATION PUBLICATION

Publication Number : 64-14251

Date of Publication of Application :01.25.1989

Int.Cl. :E02F 3/76

Application Number :62-106405

Date of Filing :07.13.1987

Applicant :KOMATSU Ltd.

Inventor :MATSUMOTO,Norihisa

Specification

1. Title of the Invention

BLADE MOUNTING APPARATUS OF BULLDOZER

2. Scope of Claim for a Utility Model

A blade mounting apparatus of a bulldozer in which a tilt-cylinder is mounted to one of a pair of right and left blade supporting arms pivotally attached to both sides of a tractor, leading ends of the blade supporting arms are attached to both sides of a back surface of the blade, and the tractor and the back surface of the blade are connected by two right and left elevating cylinders therebetween, characterized in that the apparatus is provided with a tug link in an oblique direction for connecting one of said blade supporting arms and the back surface of the blade via a ball joint.

3. Detailed Description of the Invention

(Industrial Applicability)

The invention relates to a blade mounting apparatus of a

bulldozer, and more particularly to a blade mounting apparatus of a bulldozer structured such as to prevent a mounting constituting part from being damaged by a stress generated at a time of inclining the blade laterally, that is, at a time of tilting the blade. (Prior Art)

A tilt dozer is structured such that a blade supporting arm is exposed to a reaction force at a time of tilting a blade, and a mounting joint portion such as a supporting arm or the like tends to be damaged in the case that a thrust load is applied to the tilted blade. Accordingly, in order to cope with this matter, various proposals have been conventionally filed.

A bulldozer with a horizontal brace structured such that a brace is interposed between a bulldozer blade and a frame of a tractor to which the blade is mounted, thereby absorbing a force in a lateral direction generated by a reason why the blade is brought into contact with a treated material and the other reasons has been known, for example, by Japanese Patent Publication No. 57-17132 and the like.

Fig. 6 shows the known structure mentioned above. In the drawings, reference symbol a denotes a crawler belt, reference symbol b denotes an engine room, reference symbol c denotes a cab, and reference symbol d denotes a blade. The blade d is supported to front ends of blade supporting arms f and f pivotally attached to a frame (not shown) by universal joints e and e. The blade d is held at an upright position by braces g and h. The blade

d is tilted by operating a jack provided in the brace h by a liquid pressure, and the blade d is vertically moved by a jack i. The jack i is supported from both sides of the engine room c, and is pivotally attached to a back side of the blade d in a rod j of the jack. Reference symbol k denotes a link, which is connected between one blade supporting arm f and a vehicle body front frame m by ball joints n and o.

Fig. 7 shows another prior art, in which the same reference symbols are used in the same positions as those in Fig. 6. Reference symbol f denotes right and left blade supporting arms, in which connecting levers g are pivotally attached to both sides of the back surface of the blade d, respectively, and any one of the connecting levers g forms a cylinder g'. A bracket p is fixed to one supporting arm f, a bracket r is fixed to another supporting arm f, and a link q is pivotally attached and connected to the brackets r and p via spherical joints s and t.

(Problem to be solved by the Invention)

As mentioned above, the apparatus shown in Fig. 6 is structured such that the connecting link is connected between the vehicle body front frame and one blade supporting arm by the ball joint so as to serve as the tilt receiving structure. When the thrust load is applied to the blade, a compression tensile stress is applied to the connecting link with respect to the stress so as to received the thrust load, and the connecting link is oscillated vertically by the ball joint at a time of tilting so as to form

a tilt runout.

However, since connecting the vehicle body and the supporting arm is limited by an elevation of the blade, and the thrust load is received only one connecting link, there is a defect that an excessive stress is concentrated in the joint portion and the joint portion is broken.

Further, in the apparatus such as the apparatus previously proposed by the applicant of the present invention and shown in Fig. 7, structured such that the supporting arm is connected between the right and left blade supporting arms via the link, the arm is exposed to the compression tensile force with respect to the thrust load applied to the blade, and the link is oscillated and displaced by the ball joint portion at a time of tilting, so that there is an advantage that it is possible to prevent the blade from being oscillated laterally by the simple structure and a cost can be reduced. However, when the thrust load is applied and the strong compression and tensile load is applied to the arm, there is a risk that the excessive load is all concentrated to the ball joint portion in the same manner as the structure shown in Fig. 6 due to one link, thereby breaking the connecting portion.

(Means for Solving the Problem and Operation)

The invention is made by taking the points mentioned above into consideration, and is structured such that in a bulldozer in which a tilt-cylinder is mounted to one of a pair of right and left blade supporting arms pivotally attached to both sides of

a tractor, leading ends of the supporting arms are attached to both sides of a back surface of the blade, and the tractor and the back surface of the blade are connected by two right and left elevating cylinders therebetween, the apparatus is provided with a tug link in an oblique direction for connecting one of the blade supporting arms and the back surface of the blade via a ball joint. Accordingly, it is possible to prevent an excessive concentrated stress from being concentrated to a joint portion by absorbing a thrust force applied to the blade by a reaction force generated in the tag ring, thereby easily executing a tilting operation.

(Embodiment)

A description will be given below of an embodiment in accordance with the invention with reference to the accompanying drawings.

Fig. 1 is a plan view of a main portion thereof, and Fig. 2 is a side elevational view of a whole.

In the drawing, reference numerals 1_1 and 1_2 denote left and right crawler belts, reference numeral 2 denotes a vehicle body, reference numeral 3 denotes a blade. The blade 3 is supported to front ends of left and right blade supporting arms 5_1 and 5_2 pivotally attached to a frame by trunnion-type joints (universal joints) 4_1 and 4_2. Reference numerals 6_1 and 6_2 denote braces. A tilt-cylinder 7 is mounted to one of the braces. Reference numerals 8_1 and 8_2 denote elevating cylinders. The supporting arms 5_1 and 5_2 are respectively connected to brackets 10_1 and 10_2 of the blade

by universal joints 11_1 and 12_2.

The structure mentioned above is the same as the conventional one.

The features of the invention are as follows. In other words, a tug link 9 is provided in an oblique direction as shown in Fig. 1 between one blade supporting arm 5_2 in the left and right blade supporting arms and a back surface of the blade 3, one end of the tug link 9 is connected to the bracket 12 of the blade supporting arm 5_2 by using a ball joint 13, and another end of the tug link 9 is connected to a bracket 14 provided in the back surface of the blade 3 by using a ball joint 15.

In accordance with the structure mentioned above, when sideward loads F_1 and F_2 are applied in a longitudinal direction of the blade 3, a compression load and a tensile load are generated in the tug link 9, and a bending moment is generated in the blade supporting arm 5_2, as shown in Figs. 3 and 4. Accordingly, it is possible to prevent the blade 3 from being laterally oscillated.

Further, when obliquely moving the blade 3 to left and right inclined positions, the blade supporting arm 5_1 can be optionally oscillated and displaced with respect to the blade 3, so that the tug link 9 does not form an obstacle to anything, and the blade 3 can be smoothly moved obliquely to the left and right inclined positions.

Fig. 5 shows a relation between a tug link load f and left and right trunnion reaction forces R_1 and R_2, at a time when the

sideward load F is applied. A relation $R_1 = F$, $R_2 = 0$ and $f = F \times a/b$ is established.

In this case, a = length between trunnion-type joint 4_2 and ball joint 11_2

b = distance in vertical direction from ball joint 11_2 to tug link 9

Therefore, in accordance with the embodiment of the invention, tilting the blade to any of the left and right sides is executed by expanding and contracting the tilt-cylinder. Further, even when a thrust load is applied to the blade, the reaction force is applied to the tug link so as to absorb the thrust load, and no overburden is applied to the joint portion.

(Effect of the Invention)

Since the invention is structured as in detail described above, in order to tilt the blade to any of the left and right sides, the tilting operation can be easily achieved by expanding and contracting the tilt-cylinder, and since the thrust load applied to the blade can be absorbed by the reaction force applied to the tug link, no overburden is applied to the joint portion and the joint portion is not damaged.

Further, since the structure in accordance with the invention is simple in structure and has a reduced number of joints, a maintenance is improved by just that much. Accordingly, the structure having a higher reliability can be obtained.

4. Brief Description of the Drawings

Fig. 1 is a plan view of a main portion of an embodiment in accordance with the invention, Fig. 2 is a side elevational view of a whole of the embodiment, Figs. 3, 4 and 5 are views explaining respective operations, and Figs. 6 and 7 show two prior arts.

2 ... vehicle body, 3 ... blade, 4_1, 4_2 ... trunnion-type joint, 5_1, 5_2 ... blade supporting arm, 6_1, 6_2 ... brace, 7 ... tilt-cylinder, 8_1, 8_2 ... blade elevating cylinder, 9 ... tug link, 10_1, 10_2 ... bracket, 11_1, 11_2 ... ball joint, 12, 14 ... bracket, 13, 15 ... ball joint.

FIG.1

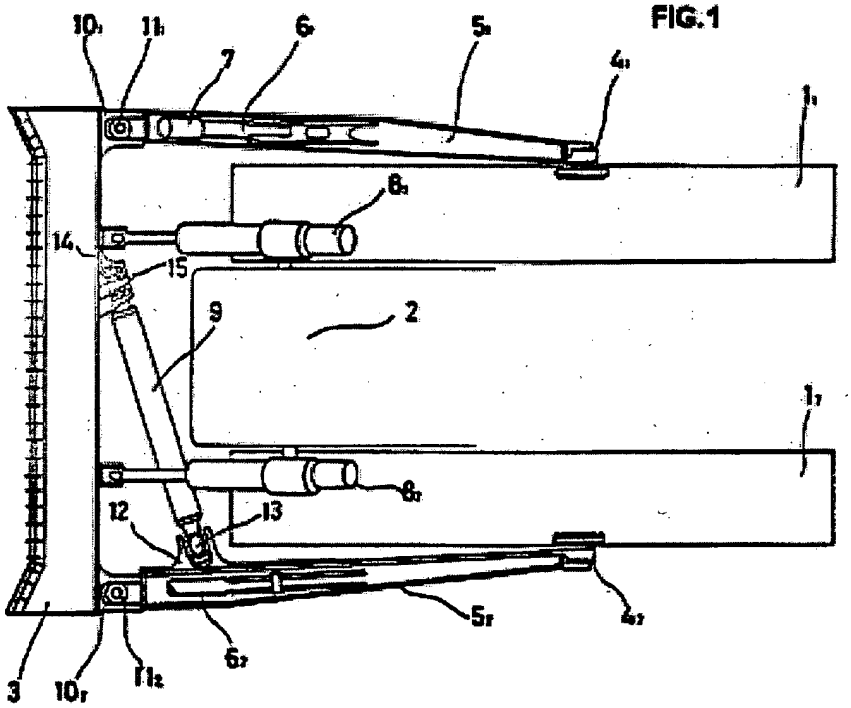

FIG.2

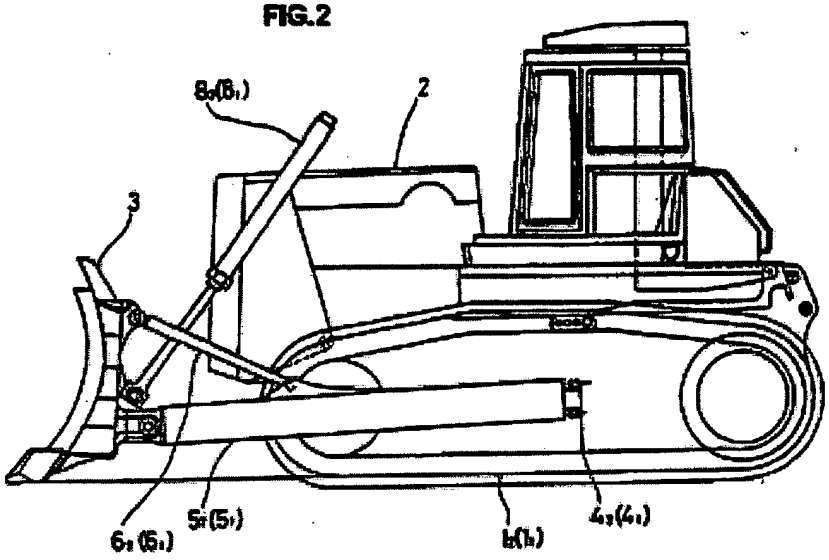

FIG.3

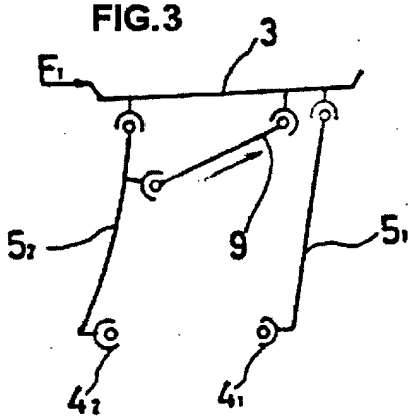

FIG.4

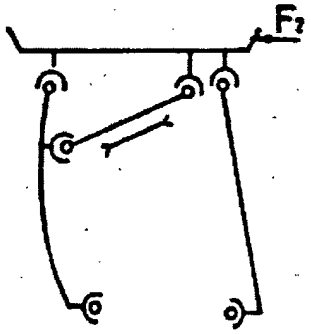

FIG.5

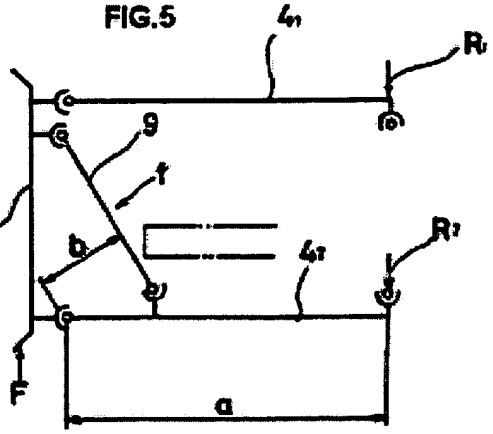

FIG.6

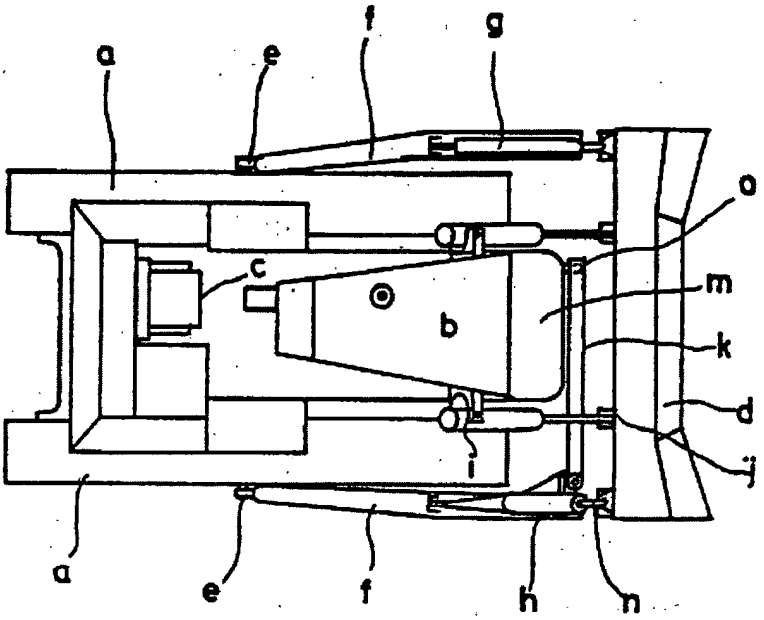

FIG.7